siderable pressure was proved by the fact that as soon as the dura was opened they bulged markedly out of the canal.

The tumors were relatively benign in their course, they had no tendency to perforate the dura or to invade the surrounding bony structures. In this respect they differed from many of the cases of diffuse intradural sarcoma in the literature (Schultze,[5] Spiller,[6] etc.) and were like those reported by Selberg[7], Warrington,[8] Klineberger,[9] etc.

The results of the operative interference were not satisfactory, although there was considerable improvement in two of our patients. It was impossible to remove the growths entirely, although most of it could be removed if the operation be divided into two stages so that the tumor be allowed to extrude from the spinal canal in the manner described. In the one patient who received injections of Coley's fluid and *x*-ray treatment, not much was gained thereby. While the danger from the operative interference was small, our only hope for radical removal lay in our ability to recognize the existence of the tumor early and to refer the patient to the surgeon early. If the patients had been operated upon before the tumors had attained such large size, radical removal might have been possible.

SOME CASES OF HYPOTENSION ASSOCIATED WITH A DEFINITE SYMPTOMATOLOGY.

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It is difficult to state just how low the systolic pressure may fall and yet be considered normal. In an individual who has been observed over a period of time and in whom one has determined a uniform pressure, any deviation from this standard may with justification be regarded as abnormal if not pathological. But for the rank and file of individuals it must remain a purely arbitrary judgment at what figure to place the lower limit of normal pressure, and the standard thus erected must be regarded as but an individual opinion; nothing more.

Janeway draws the line between normal and subnormal systolic pressure at 100 mm. Hg. (R.R. 5 cm.) and 90 mm. (12 cm., G.).

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[5] Mittheil. a. d. Grenzgebieten, 1903.

[7] Beiträge z. klin. Chir., 1904, xliii, 197.

[9] Monatsschr. f. Psych. u. Neurol., 1908.

[6] Amer. Jour. Med. Sci., 1908, cxxxv.

[8] Lancet, 1905, ii, 740.

I prefer using the auscultatory method, to place the limit at 120 mm. Hg., and I believe pressures below this must fall in the category of lowered or low blood pressure. Such a limit is purely empirical, and observations made with a standard instrument, with a uniform method, and under uniform conditions, in many thousands of healthy individuals, this procedure alone can fix the limit with any degree of accuracy.

The maintenance of blood pressure depends primarily on the preservation of the normal peripheral resistance and on the force of the cardiac systole. The following lines copied, in the main, verbatim from Cannon[1] gives a concise view of conditions which tend by decreasing peripheral resistance, to cause lowered blood pressure.

"Fall of pressure is seen in poisoning by chloral and alcohol, both of which paralyze the vasoconstrictor centre. The collapse of the circulation that sometimes occurs in the course of certain of the infectious diseases, such as pneumonia and diptheria, may be in part due to this cause. In surgical shock, again, the widespread abolition of vascular tone is accomplished by a low blood pressure. In these instances the reduction may be due to a rapid pouring of the blood out of the relaxed vessels or to a stagnation of the blood in the veins to such an extent that the heart does not receive a sufficient supply to continue its normal discharge. Which of these conditions plays the more important role is not yet determined. Henderson has argued from evidence which he has accumulated that the condition of shock[2] is attributable entirely to a failure of the supply of venous blood to the heart.

"As is well known, vasoconstrictor tone can be diminished at will by use of the nitrites. A few whiffs of amyl nitrite produce a sharp drop in arterial pressure, which is, however, soon regained.

"A physiological condition attended by lowered arterial pressure is sleep.

"A low pressure may be due not to vasodilatation but to a weak heart, and any agency used to increase vasoconstrictor tone under these circumstances is likely to stop the heart at once. Indeed, my attention," says Cannon, "has recently been called to a case of precisely this character in which the administration of adrenalin to raise the pressure was followed by instant death—the laboring heart was overburdened by the sudden increase of load and stopped immediately. Until the part played by each of the two factors, therefore, the heart and the arterioles, is clearly discriminated the intelligent treatment of any disturbance of normal arterial pressure is impossible."

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[1] Boston Med. and Surg. Jour., 1911, clxv, 672.

[2] Amer. Jour. Phys., 1910, xxvii, 158.

The causes of hypotension or the condition in which hypotension is a phenonenon may be classed as follows:

1. Acute infections, excepting epidemic cerebrospinal meningitis.
2. Chronic wasting diseases: carcinoma, tuberculosis, cachexia from whatever cause, Addison's disease.
3. Hemorrhage, drugs, chloroform.
4. Nervous diseases: general paralysis of the insane neurasthenia, after epileptic seizures, sometimes in tabetic crises, after lumbar puncture, Basedow's disease (at times), osteoarthritis, exhaustion, shock--surgical or anaphylactic.
5. Cardiovascular diseases: tachycardia, dilatation of the heart, arteriosclerosis (at times), mitral stenosis, decompensatory cardiac lesions.
6. Blood dyscrasias: anemia, polycythemia cum sphenomegaly.
7. Renal condition: cyclic albuminuria, nephritis (at times) amyloid disease.
8. Intoxications: alcohol, tobacco, acute adrenal insufficiency.
9. Terminal hypotension preceding death.

A search of the literature reveals a lamentable paucity of specific articles on low blood pressure, the subject of hypertension apparently having dominated the interest and riveted the attention of writers. Anyone who includes blood-pressure estimations in the routine examination of every patient must have been impressed, however, with the not infrequent occurrence of blood pressures below 120 mm. Hg., blood pressures lying between 110 and 120 mm. Hg. Less common are the pressures lying between 100 and 110 mm., and still more rare are those between 80 and 100 mm.; but apart from exciting surprise at the abnormally low tension the phenomenon seems to have been little investigated. It is on account of the very cavalier treatment of the subject, that contributions devoted to its explanation or papers dedicated to report of cases are extremely valuable. If one reads all references to hypertension he will be astonished at the amount of research performed along these lines, and will gather the incorrect and hasty impression that hypertension is the only problem in sphygmomanometry. It cannot be denied that a persistent high blood pressure carries in its train more destruction and more pernicious damage, and that therefore it deserves more consideration than does low pressure; yet this seems hardly a satisfactory explanation on for the neglect which hypotension has experienced.

Its importance and significance in certain surgical conditions, notably shock; in certain clinical crises, such as anaphylactic shock; and its almost constant presence in acute fevers or infections; these are well-established facts. They are valuable additions to our knowledge, no doubt, but hypotension in cases other than in the above, in individuals who present no apparent lesion but who consult the physician about symptoms to which the specious diagnosis neurasthenia might be too readily applied, hypotension in these patients is a subject well worth the study. Whether the low blood pressure in certain persons is a cause of the symptoms or whether it is a result of some agent causing the symptoms one cannot say.

The subject of hypotension has made a special appeal to Münzer,[3] who presents his paper with three prefactory remarks, with the censure that the subject has received but scant attention, with the expressed aim to separate certain cases into groups, and with the frank admission "wobei ich mir dessen (einige Formen) wohl bewusst bin, dass es bei dem gegenwärtigen Stand unseres Wissens nicht möglich ist, das Gebiet systematisch zu erschöpfen.". Münzer endeavors to classify his cases in groups, and succeeds in forming six. Some of his arguments for this grouping and the basis for his diagnosis seem to be dogmatic rather than irrefutably sound. His paper, nevertheless, has this value, that it frankly invites criticism, its avowed object being to stimulate interest in the subject of hypotension.

The first of Münzer's groups is the hypotension seen in arteriosclerosis. He believes that this is a common cause of low pressure, and offers as explanation that the blood flows through the large hard vessels, as does a fluid through an unyielding tube; there being no periodic distention of the vessel wall, the tension is lowered. In some instances the pressure was as low as 85 systolic, 75 diastolic. A common trilogy of symptoms was headache, vertigo, and even fainting.

A second group of cases occurs in what Münzer believes to be status thymo lymphaticus. Wiesel[4] and later Hedinger[5] observed hypoplasia of the chromaffin system in cases of this kind, and since Schur and Wiesel[6] have demonstrated hypertrophy of the chromaffin system in cases of hypertension, Münzer believes one may, by analogy, expect hypoplasia to be associated with low blood pressure. He proceeds on insufficient grounds, I believe, to arrange certain cases in the category of status thymo lymphaticus.

The remaining groups of disease associated with hypotension are orthostatic albuminuria, chronic nephritis, paroxysmal tachycardia, and cachectic conditions.

That hypotension is by no means an uncommon feature of arteriosclerosis there can be little doubt, as Huchard's reference in the *Transactions of the XVI International Medical Congress*, in Budapest (1909), will show: I have under my care at the University Hospital Medical Dispensary a case in point.

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[3] Wien. klin. Woch., 1910, p. 1341.

[4] Virchow's Archiv, 1904, Band clxxvi.

[5] Ztsch. f. Pathol., 1907, p. 527.

[6] Deutsch. med. Woch., 1907, No. 51.

Thomas MacR., aged sixty-seven years, engineer, was referred from the eye dispensary with retinal hemorrhages in the left eye. There was decided arteriosclerosis and urinary findings suggesting intestitial nephritis, *i. e.*, polyuria, low specific gravity, albumin, and casts. The blood pressure, which in this case was a variable quantity, had been as low as 123 to 80 mm. Hg.

I have been most interested in cases of low blood pressure occurring in the absence of any demonstrable organic lesion. These have been patients, for the greater part, on the ascent or the crest of the curve of life, who have presented certain symptoms common to each, and who have been markedly improved by practically the same therapeutic measures. As illustrative cases, the following are quoted. (Auscultatory method; Stanton sphygmomanometer; Widecuff.)

CASE I.—H. F., female, aged twenty-three years, consulted me July 14, 1911, on account of headache. Patient had been complaining of headaches for the previous two or three years. The attacks were intermittent, there being often two or three months' interval, and then again repeated several times in the same week. The headaches were situated in the top of the head and were described as pulsating and throbbing in character, with a feeling of tenseness. The patient could ascribe no cause for the headaches, although sleep usually brought relief. She had less endurance than formerly, and "played out" readily. Bowels were regular, no gastric symptoms. Eyes were thoroughly refracted five years before.

The family history and previous medical history were negative. The menses were regular, but the patient had some pain in the right iliac region, from which she suffered a good deal at irregular intervals. There was no aggravation of headache at these times nor at the time of menstruation.

The physical examination was negative. The blood pressure at the time of the first visit was 80-55 mm. Hg. Under treatment during the next four months the blood pressure rose to 120 mm. Hg., and with this improvement the headaches disappeared almost entirely.

CASE II.—E. C. W., female, aged thirty years. Referred by Dr. Langdon. On the evening of September 25, 1911, I was summoned to give relief for a severe headache. The patient stated that since the spring of 1911 she had suffered intensely with violent frontal headache, vertigo, swelling of eyes and of ankles, scanty urine, and less endurance. In August, 1911, she underwent a severe nervous strain, and admitted in September that she was at the "end of her rope."

Patient says she has at times of periods pain over the right ovary, and that her menstruations are irregular. Owing to the fact that her mother experienced the menopause when thirty-five years and her maternal grandmother had "change of life" at thirty-two years, patient is apprehensive and fearful that her present symptoms may be phenomena incidental to what seems to be a familial early menopause. Bowels regular.

On examination the urine was found to be negative. The blood: Hemoglobin, 80 per cent.; erythrocytes, 4,030,000; blood pressure 110-75. Large doses of bromides brought about amelioration from the headaches, and the patient was sent to the country for a three weeks' stay. On her return she stated that in this time she had had four severe attacks. Blood pressure, 115-65; hemoglobin, 90 per cent.

In December, at which time the blood pressure had risen to 120-70, the patient stated that she had not felt so well for years, and that she had not had a headache for over a month.

February 28, 1912, patient came to see me on account of slight return of headaches during the previous week. Blood pressure, 110-60 mm. Hg.

March 20, 1912, with a rise in pressure, there was subjective improvement, and apart from a feeling of distention after meals the patient felt "first-rate."

CASE III.—F. J. G., male, aged fifty-one years, lawyer. Referred by Dr. E. I. Keffer, November 28, 1911. His chief complaint was failing of memory. Patient had been for thirty years of a nervous disposition, and had received sporadic treatment during this time for his trouble. Lately he had found his memory to be less keen in court work; he was so fearful of himself in public that he was beginning to devote himself entirely to office consultations. With the failing memory he had had persistent insomnia, and was subject to unaccountable attacks of irritability. He complained of no headache, but described his mental symptoms as if a cloud were enveloping his brain. Vertigo persistent, but not severe, was an unpleasant symptom. He "played out" both mentally and physically; would get up tired in the morning, and had difficulty in concentrating his attention. He was insistent that he had not worked hard for five years, but his law partner adduced evidence to the contrary.

The patient had some gastric symptoms, flatulence, belching, and acid eructations. Appetite was variable, but ate everything. Bowels were regular. Apart from overindulgence in tobacco there was nothing in the patient's further history which seemed to have a bearing on the case.

On examination his lungs were negative; heart was enlarged, slightly to the left; there was a systolic murmur at the apex transmitted slightly. After removal of a test meal (125 c.c., total acid 74, free HCl 32) the stomach was found to be slightly dilated, lower border 2 cm. below umbilicus. The liver was slightly palpable. Blood: hemoglobin, 90 per cent. Urine and feces negative; blood pressure, 105-55. Eyes were refracted five years before.

Treatment seemed to be ineffective with this patient, that is, blood pressure rose to 116, but could be brought no higher. The patient had persisted, however, with the suggestions made to him and at the last visit, September 23, 1912, stated that he saw a marked improvement since a year before, and that for the last two weeks he had felt better than ever before. Blood pressure at that time was 123-55. He had regained his confidence when talking in public and had lost his fear of being unable to express himself in the courts.

Case IV.—R. E. G., male, aged twenty-one years, statistician. Referred by Dr. Knowles Feb. 15, 1913. Chief complaint, constipation and eruption on the face. Dizziness from "some cause or other."

The acne he had had for five years, but constipation made its appearance five or six weeks before. The previous summer he began to have dizzy spells, which were gradual in onset. These attacks followed exercise or any mental stimulus. Although he does not faint, he seats himself as quickly as he can, as he thinks he might fall if he stood. There is no nausea or vomiting. He feels perfectly well as soon as the dizziness passes off, which it does in a few minutes. He has no headaches. Eyes were examined October, 1912.

Patient takes a good deal of exercise in the form of walking, although he studies, as a rule, about ten hours a day. No gastric symptoms. He is losing weight; best weight 130 pounds, three years ago; now 117 pounds.

Patient's habits are exemplary. The family history discloses a nervous taint in all members of the family.

Examination is negative. Blood pressure, 110-60.

March 22, 1913. No more dizziness. Bowels regular; weight 121½ pounds; blood pressure, 120-60; feels fine.

Case V.—G. L., male, aged forty-two years, laborer. Admitted to my dispensary at the University Hospital January 20, 1913, complaining of intermittent spells of dizziness.

Patient states that these spells come on once every week or two. Each attack was preceded by a feeling of warmth, then his sight was blurred. There was numbness in the head, followed by vertigo. Patient reels if standing, and has to support himself to avoid falling. "Spells" only come on while standing. If patient lies down the spell passes off in about an hour, but if he remains standing they may last half a day. As he recovers, he is nauseated, has a gnawing pain in the epigastrium, and sometimes vomits.

He is unable to talk "much." No symptoms remain after the spell. He is constipated, and takes laxatives several nights a week; otherwise the gastrointestinal tract is negative.

During the attacks he has a bearing-down sensation of the brows and double vision. He notices sensation of constriction in fauces and pharynx. Mouth floods with saliva, and at the same time he experiences difficulty in swallowing. This is followed by a feeling of nausea, and at times he may vomit. He also feels an epigastric pulsation. He has difficulty in breathing, his head feels too heavy for his body, and he dreads falling from dizziness, therefore keeps his eyes on the ground during attacks. He has no noises in ears. Had eyes refracted about a year ago and lenses corrected. Hypermetropic astigmatism, but this has in no way influenced his attacks, which come with some degree of periodicity once every week. Has some slight palpitation of heart on exertion; marked hypotension.

These five serve as illustrations of certain phenomena associated with hypotension. Although not each symptom is present in every instance, the chief symptoms in these cases are headache, vertigo, mental and physical tire. These symptoms have been significant, inasmuch as one or all have been the chief complaint of the patient, and with rise in pressure the patients have been much improved. The question which naturally arises is, What is the etiological factor?, and to this there must be a confession of ignorance. Tuberculosis must be the condition to suspect whenever there is a lowered blood pressure, provided no other cause such as tabulated above can be found, but in none of these five patients whose histories have been reproduced was there slightest evidence of this infection. It would be purely supposititious to hold that a small lesion might still be present and escape careful physical examination. There is no clinical evidence to support this hypothesis, and improvement followed a course of treatment which would presumably have had a somewhat opposite effect in tuberculosis.

Can the low pressure be an expression of auto-intoxication? Inasmuch as this theme has been so well worn that we perceive the insubstantial warp, one should omit it from his medical diagnosticum. The more closely one studies the cases of supposed auto-intoxication the more frequently does he find an underlying organic condition to explain the symptoms, such as hepatic cirrhosis, enteritis, redundant sigmoid, visceroptosis, etc. If one is to take the symptomatology as given by Combe ("Auto-intoxication intestinale") as an indication of an underlying intestinal intoxication, he will be able to ascribe to the latter practically every symptom flesh is heir to. There may be *bona fide* cases of auto-intoxication, but these must be very few. At any rate the methods at our disposal for their recognition are at fault, and an estimate formed from quantitative and qualitative urinary examinations, no matter how painstaking and exact, is by no means a correct one. Feeling that auto-intoxication is a poor diagnostic term I prefer not to consider it as a cause or as the cause of the symptoms exhibited by these patients.

Were constipation a common feature in these cases it might be assumed that retention of feces with absorption of waste products—in other words, auto-intoxication again—might be the cause of the hypotension. Correction of the constipation then might bring about amelioration of symptoms. In only one case was constipation a feature, and as no drugs were given for this, reliance being placed on certain exercises, the problem is not so simple. It is a question, moreover, whether constipation alone is associated with absorption of certain waste products. I am by no means convinced that it is. Again, it is a nice point to decide whether constipation is the cause of the hypotension or whether the hypotension, with its other symptoms of tire, might not bring about relaxation of the intestinal musculature as it does of the voluntary muscles. And may it not be true that with increased vasomotor tone, normal action of the intestines has been brought about, rather than that relief from constipation has raised the blood pressure by eliminating the absorption of waste products?

The diagnosis of neurasthenia applies here as little as does that of auto-intoxication. Neurasthenia seems to be a convenient diagnostic catch-all for conditions not perfectly understood, and great care should be executed in making this diagnosis. Moreover the blood pressure is not lowered in neurasthenic states, but raised, as shown by Stursberg[7] and Stursberg and Schmidt.[8]

I confess that I can offer no explanation of the hypotension. The significant features in these cases is that subjectively they were alike, and with the same method of treatment all showed improvement and some were cured, and with this improvement as cause or effect, was associated an increase of blood pressure.

TREATMENT. The treatment which has been given these patients consists essentially of the following: They are instructed to go to bed at a reasonable hour and to rise at a certain time each morning. Immediately on rising they are to perform a series of exercises, consisting of free movements, somewhat after the following plan:

1. Stand erect with the arms extended and the fingers in contact above the head. Stoop forward and try to touch the floor with the finger-tips, moving slowly, and return again to the original position.

2. Lie at full length on the floor or bed upon the back, with the

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[7] Deutsch. Archiv. f. klin. Med., 1907, xc, 518.

[8] Münch. med. Woch., 1913, p. 174.

hands under the hips, and bring each leg alternately and slowly to a position at right angles to the body. Perform the same motions with both legs conjointly.

3. Lying at full length upon the back, the hands clasped behind the head, bring the elbows in, bend the body forward until the face touches the knees, returning again slowly to the original position.

4. Standing position: extend the arms sidewise, the elbows straight, until the hands meet above the head. Stretch the arms as much as possible in doing this. Inhale deeply as the arms go up, and exhale slowly as they come down.

5. With the hands on the hips, the thumbs behind, without moving the feet, turn the trunk as far as possible to the right, then to the left. As the body turns rub the fingers deeply into the abdomen.

6. Raise the arms laterally, the palms upward, until the level of the shoulders is reached, bring them forward until the fingers touch; then reverse the movement, extending the arms backward as far as possible, at the same time rising upon the toes.

7. Breathing: Hands at hips, head backward bend, inhale through nose; head erect, exhale through nose and mouth five to ten times.

In order that the exercises should have the desired effect, they must be performed regularly, every morning, at least ten minutes being devoted to the task. They should at first be performed slowly, with intermissions of a few seconds for rest and deep breathing. As the muscles become accustomed to the work they may be increased in rapidity and duration, but never to the extent of producing exhaustion or prolonged breathlessness.

Following these or some such exercises, a shower-bath, first hot and then as cold as can be well borne, should be taken, but if there are no such appointments, a good modification can be obtained from the following:

Stand erect in the tub in which a little hot water remains, and sponge the entire body quickly with cold fresh or salt water; or pour a pitcher of cold water over the back and spine, or use a douche or spray. This should be immediately followed by a brisk rub with a coarse towel, continued long enough to produce redness of the skin. Following this, rest in the recumbent position, well covered up, for five or ten minutes before dressing. Bathroom should be warm.

Definite rules are given for the number of hours work to be done a day, and a certain amount of relaxation is insisted upon. Golf, horseback-riding, tennis, walks in the country, are all useful in bringing about a temporary dropping of business, professional, or domestic trials.

In all of these cases I have prescribed ascending doses of tincture of nux vomica, beginning with 15 drops three times a day after meals and increasing 3 drops a day, so that the first day, 15 drops three times a day are taken, then 16, 17, and so on. The limit to the increase is the first sign of the physiologic action of the drug, and when this is obtained the dose is dropped 5 drops and maintained there for a period of two to five days, after which the number of drops is decreased 15 drops a day, dropping from 45, for example, 40, three times a day, to 35, three times a day, etc. The decrease is continued to the original 15 drops three times a day, which dose is maintained for a week, and then the nux vomica is discontinued.

Regarding the dose of nux vomica which may be given, patient Case III took 75 drops three times a day without experiencing any physiologic effect of the drug. The individual tolerance to strychnine is variable, and not everyone can take such large doses without feeling some toxic effect.

For the coexisting constipation use was made in the following manner of the exercises described by Fernet.[9] I quote from my article in *Progressive Medicine*, December, 1912, p. 102.

"The patient, before arising in the morning, is to lie on the back, and take five or six deep breaths, with the mouth closed, protruding and retracting the abdomen with each respiration. After a few moments of natural breathing the same procedure is repeated, and is kept up for five or six times. By means of the deep breaths, Fernet claims that the abdominal organs are subjected to a kind of massage, which is further augmented by manual massage during the remissions of normal breathing. After rising and bathing the patient should partake slowly of breakfast, and afterward go to the toilet, whether he feels the desire to defecate or not. If there is no bowel movement the breathing exercises should be repeated, and in place of the massage, rectal gymnastics should be practised, consisting of voluntary movements of the anus, efforts of expulsion and of retension. Under no condition should there be any straining."

Excessive indulgence in tobacco, alcohol, tea, and coffee when confessed to should be corrected. These and other detrimental habits, too individual to enumerate, should receive due attention, the object being, by means of a sensible conduct of life, to bring the bodily functions to a normal state of activity.

Edgecombe[10] writes that his attention has been attracted to a class of cases, suffering from no disease in particular, but complaining of general slackness and want of tone, with a systolic pressure frequently below 100 mm. Hg. (Oliver). He records night and morning readings of systolic pressure in a subject for two hundred consecutive days, and his observations are of great interest. After trying all sorts of remedies in this case, he says the permanent raising of a low pressure is a matter of great difficulty. He has found that a small rise is coincident with marked amelioration, and regards exercise, diet, and change of residence to high altitudes preferable to drug treatment. His subject was a large meat-eater, and he recommends elimination of this staple from the dietary.

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[9] Bull. de l'Acad. de Méd., 1911, 3d series, lxv, 662.

[10] Practitioner, 1911, lxxxvi, 515.

To his statement that it is difficult to raise a lowered blood pressure there can be no opposition, and I am also in accord with him when he says small rises in pressure bring about marked improvement of the condition. I am inclined to believe that of all the measures to employ in raising blood pressure in such cases the least to be considered are drugs, although I should be unwilling to abandon the use of strychnine when given in full doses as described above.

THE CLINICAL SIGNIFICANCE OF DIASTOLIC AND PULSE PRESSURE.[1]

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In the last few years the importance and clinical value of determining blood pressure has become recognized and the procedure now stands among the indispensible methods employed in physical diagnosis.

The more recent graduates and certainly all up-to-date clinicians now make frequent observations of the systolic blood pressure; but comparatively few estimate diastolic pressures, and of this number many fail to understand the significance of their observations.

The reason for this is inability to appreciate the significance of or to intrepret the diastolic readings is clear.

Until the use of the auscultation method of determining blood pressure was introduced by Karokow in 1905, it was virtually impossible to obtain accurate and uniform diastolic readings outside of a clinical laboratory, where large cumbersome recording instruments were used, so that the wide differences in diastolic readings obtained by different men made any accurate scientific

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[1] Read before the Jefferson Hospital Clinical Society, November 21, 1913.